Integration of Construction Inspection Lessons Learned into the 10 CFR Part 52 CIP

Inspection Program Management[1]

Lessons learned from previous construction activities in the area of inspection program management resulted in using four inspection manual chapters (IMC) to describe distinct aspects of the CIP rather than a single all-encompassing document. The inspection manual chapters compartmentalize the inspection activities to reflect the anticipated use of the 10 CFR Part 52 licensing process. Although the nature of the work may result in the IMCs overlapping in their implementation, each is directed at a specific aspect of 10 CFR Part 52, and the IMCs are designed to be completed independent of each other. (LL1b)

For example, IMC-2501 describes the inspections performed to support the issuance of an early site permit (ESP). Those inspection activities must be completed before an ESP is issued. However, if an applicant for a combined license (COL) under 10 CFR Part 52 proposes a site not previously approved, the inspection program contained in IMC-2501 will be conducted in parallel with the inspections contained in IMC-2502, which supports the review of the COL application.

IMC-2503, "ITAAC Inspections," and IMC-2504, "Non-ITAAC Inspections," will be implemented as soon as they are needed to monitor construction activities. If long lead-time components are ordered early, these inspections may occur even before the COL application is submitted. Because of the importance of ITAAC in the licensing process and the need to support the Commission's finding under 10 CFR 52.103(g) on whether the acceptance criteria have been met, the staff issued a manual chapter specifically addressing the inspection of ITAAC. This approach allowed the staff to write inspection procedures and devise sample selection criteria that focus on ITAAC and ITAAC-related activities. Focusing on the ITAAC will assure sufficient inspection information to support close out of each ITAAC and the subsequent Commission finding. (LL1a, 2a)

IMC-2504 contains a wide range of inspection activities. The inspection of the licensee's construction program will focus on its programmatic elements. These include but are not limited to construction QA; the program for reporting defects under 10 CFR 50.55e; problem identification and resolution for construction activities (including those related to allegations); training and qualification of construction workers; oversight and control of all contractors; planning of significant work activities including adequacy of construction procedures; and the process used to submit an ITAAC determination to NRC for verification of its successful completion. (LL 2b)

A significant portion of the inspections in IMC-2504 are directed at ensuring that the plant staff and the programs they will use to operate the plant are ready for fuel load, startup testing, and power operations. The operational readiness of the plant will depend, at least in part, on the

[1] Within the paragraphs of this enclosure, the specific lesson learned or inspection program issue from the list contained in Enclosure 1 is denoted by LL## and IPI##, respectively.

status of the implementation of the operational programs. The staff will focus its inspections on assuring that the operational programs are being developed and implemented consistent with the description and schedule described by the licensee in the application and approved by the Commission in the COL. (LL 1c)

The transfer of the plant from the construction inspection organization to the regional operating reactor organization will take place gradually as construction and initial testing activities are completed. As in the restart of Browns Ferry Unit 1, the staff will begin using the reactor oversight program (ROP) inspection procedures as the plant activities allow. Completion of IMC-2404 will occur when construction activities are complete; any remaining construction open items have been appropriately captured in the licensee's corrective action program; and the ROP tools can be used and will provide sufficient information for determining licensee performance in each cornerstone of safety. At that time, the inspection of a new plant will be in accordance with the ROP as defined in IMC-2515, "Light-Water Reactor Inspection Program - Operations Phase." (LL 1d)

The staff has identified the need to evaluate the characteristics of the new reactor designs against the ROP bases and the ROP tools, such as the Significance Determination Process (SDP) and the Performance Indicators (PI). Initial reviews suggest that because the risk profiles of the new reactor designs are different from those of the existing plants under the ROP, some revisions may be needed, but the overall ROP approach can be successfully used on plants licensed under 10 CFR Part 52.

Inspection Program Implementation

Successful implementation of the CIP is closely tied to the qualification of NRC inspectors. A new inspector technical proficiency training and qualification journal is being developed to ensure that the construction inspectors have acquired the knowledge and developed the skills necessary to implement the CIP and evaluate licensee performance during construction. Appendix C-9 will be added to IMC-1245, "Qualification Program for the Office of Nuclear Reactor Regulation Programs," and will be used to develop the technical proficiency of construction inspectors. Although Appendix C-9 is not scheduled to be issued until later in 2006, incoming construction inspection staff can begin the inspector qualification process immediately by completing the basic inspector qualification requirements in Appendices A and B of IMC-1245.

The anticipated rapid pace of construction will require that NRC have a means for monitoring the licensee's construction schedule in order to remain aware of when the key construction activities selected by NRC for inspection will occur. The staff and the industry have held on-going discussions on how to share electronic construction schedules. These discussions have identified that the reactor vendors have used the Primavera scheduling tool. NRC has since purchased the Primavera software and several members of the construction inspection team have completed training on Primavera. This will allow the staff to understand how the vendors are using the tool and how NRC may use the program to schedule its inspections. The construction inspection team will be using a vendor schedule to complete a test program aimed at understanding how to work with the different versions of Primavera that might be used by the vendors or the licensees, and how to update NRC's schedule, in real time with revised licensee information, without losing data. The staff recognizes that once a reactor has been purchased and scheduling has been turned over to the licensee, the licensee and its designated agents

(e.g., contractors) may then alter the basis, coding, and activities of those Primavera files to make them plant-specific. However, the staff is working to ensure that construction schedules are thoroughly considered so that inspection planning will reflect our understanding to the fullest extent possible. (LL 2c)

One key issue related to sharing construction schedules, i.e., that reactor vendors consider such schedules proprietary, was resolved in June 2004. The NRR staff worked with the Office of the General Counsel (OGC) to explore how best to allow NRC to obtain frequent updates to a construction schedule without the need for the licensee to make repeated requests for withholding of proprietary information in accordance with 10 CFR 2.390. NRR and OGC staff determined that, in accordance with 10 CFR 2.390, the licensee would initially submit the schedule with a request to withhold it from public disclosure and would be responsible for demonstrating that the information submitted to NRC is properly designated as proprietary and can be withheld. The staff then will review the submittal in detail to ensure that there is a legitimate basis for withholding the information as proprietary. Because the nature of the information would not change from initial submittal to update, no additional proprietary determinations would be needed and routine schedule updates from the licensee would be considered proprietary and would be withheld from the public without further evaluation. This approach would allow for a single proprietary determination, limited to the schedule and its updates, that would apply to an entire construction project.

During the construction of plants licensed under 10 CFR Part 50, engineering inspections were conducted while work authorized under a construction permit was being completed. The staff then considered the information gained through the engineering inspections when making its recommendation on whether or not the NRC should issue an operating license. However, the future use of certified designs and a combined construction permit and operating license when licensing plants under 10 CFR Part 52 precludes such a process, and the inspection program addresses how the staff will complete design engineering inspections. The staff will inspect and review the adequacy of licensee design engineering early in a construction project, possibly beginning soon after receipt of a licensing application, to assess the licensee's programs and processes for translating design information into construction documents and to assess the success of those programs based on the quality of the products they generate. Site-specific engineering, as well as first-of-a-kind engineering for the lead plant of each certified design, will be assessed during these inspections. IMC-2502 provides for inspections of first-of-a-kind (FOAK) engineering. These inspections will cover the engineering for the reactor design that was not covered as part of the design certification process. FOAK engineering inspections will be used to ensure that the design process is effectively implemented as the engineering is completed for the first plant built of a certified design or for an application that includes a custom design. The site-specific portions of subsequent applications referencing each of the certified designs will also be inspected using the FOAK inspection guidance. Through IMC-2504, NRC will assess the effectiveness of the licensee's design change process in maintaining the fidelity of high-level certified design information as changes to the engineering design are made. (LL 2d)

Under IMC-2503, the scope of ITAAC inspections will be guided through the use of the ITAAC matrix and the results of the sample selection process. Grouping of ITAAC using common characteristics was critical in establishing uniform groups upon which sampling rules could be applied. Expert panels, consisting of inspectors from each region as well as staff from new reactor licensing at headquarters, have completed a design-specific ITAAC matrix for both the

ABWR and the AP1000. The results confirmed that the matrix rules could be applied successfully to different reactor designs. As future reactor designs are certified, an ITAAC matrix will be populated with design-specific ITAAC and the information used for all plants built using that design. Each row and column of the ITAAC matrix has an associated inspection procedure that will be used when inspecting field work related to the ITAAC in that row or column. Approved procedures for inspection of ITAAC are scheduled to be issued over the next 12 months. (LL2.b)

The sample selection process considers four attributes to rate the 'value' that can be gained through direct inspection of construction activities related to an ITAAC. The sample selection process for the AP1000 was completed using a series of expert panels. The panels, which consisted of inspectors from each region as well as staff from new reactor licensing, risk assessment, and component performance and testing at headquarters, rated each ITAAC for each of the attributes. The results confirmed the functionality of the decision making process and produced a list of ITAAC for the AP1000, sorted by matrix group, and presented based on the inspection value. The ITAAC sample selection process will be completed for future designs after design certification or when the COL is issued for a plant using a custom design. From this information, the staff will define the minimum sample set for each group to establish the criteria for completion of the various inspection procedures and for use in establishing the rules that will govern the assessment process. The basis for the sample selection process is detailed in a report from Information Systems Laboratories dated September 30, 2005, titled "Technical Report on the Prioritization of Inspection Resources for Inspections, Tests, Analyses and Acceptance Criteria (ITAAC)." (ADAMS Accession Number ML060740006)

Inspection Documentation

The staff has explored methods for collecting inspection information in a way that would make it easily available and in a form that would support the staff in making its recommendation to the Commission on the completion of the ITAAC. To ensure that the bases for the staff's recommendation on whether or not the acceptance criteria have been met are complete and well balanced, inspection results will not be limited to documentation of only problem areas. Inspection observations will also document instances where inspectors found work being performed successfully. This approach will allow the staff to make a recommendation to the Commission based not only on the lack of problems but also on a record of successes. (LL 3b, 3c)

In the past, information about a construction project was often available in the various NRC inspection reports, however, there was no means for efficiently locating and compiling the information. The construction inspection team has been working with the Information Management Branch within NRR to add a database module under the umbrella of the Reactor Program System (RPS). The database is called the Construction Inspection Program Information Management System (CIPIMS) and will be used to characterize and record individual construction inspection observations, including any findings or open items that may result from an observation. The characterization of each inspection observation will establish the links to the various inspection manual chapters, to inspection procedures, to individual ITAAC and to an ITAAC matrix group. Since CIPIMS will be linked to the other parts of RPS, the staff will use those existing functions to assign report numbers, to select docket numbers, and to monitor inspection program completion status. CIPIMS will allow NRC inspectors to record observations and inspection team leaders to review and approve individual inspection

observations electronically. The staff will use CIPIMS to compile and generate draft inspection reports comprised of the various approved observations. The staff then will format the document, obtain final management approval, declare the report an official agency record, and issue the final approved inspection report in the same way it is done today. (LL 3a)

The primary benefit from using CIPIMS is that it will allow the staff to sort inspection report information using the characteristics of the various ITAAC. Identifying the characteristics of the ITAAC associated with an inspection observation as each observation is generated will allow NRC to compile a complete and accurate record of the areas inspected and evaluated throughout the course of construction. As a result, the staff will also use CIPIMS when periodically assessing inspection results and monitoring NRC's progress in implementing the overall CIP. IMC-2505, "Periodic Assessment of Construction Inspection Program Results," is under development and is scheduled to be issued in 2007.

CIPIMS will also be used as an ITAAC is being closed. When the licensee informs NRC that an ITAAC has been completed and the acceptance criteria have been met, the staff will use CIPIMS to review the complete NRC inspection history for that ITAAC to ensure that all of the planned NRC inspections related to that ITAAC have been completed and that there are no open items that would prevent NRC from concluding that the licensee has successfully met the acceptance criteria. Information about the completion of an ITAAC will be included in CIPIMS. This will allow the staff to monitor the licensee's progress toward completion of all of the ITAAC.

Guidance for the inspection staff on how to characterize and document construction inspection observations will be contained in IMC-0613, "Documenting Construction Inspections." IMC-0613 will provide the criteria for identifying findings and describe appropriate followup to close any resulting open items. The format and content of inspection reports and the administrative processes for populating and maintaining CIPIMS will be addressed in IMC-0613. The manual chapter will also describe the types of inspection findings for which enforcement action would be appropriate. An update to the construction supplement of the existing enforcement policy is being considered to describe the enforcement actions appropriate for a plant licensed and being constructed under 10 CFR Part 52. (IPI 6, 7, 13, 14)

Quality Processes

The successful implementation of a comprehensive quality assurance (QA) program by the licensee will be an important indicator of the licensee's ability to manage the various activities associated with a large construction project. Each of the four CIP manual chapters provides for review of different aspects of the licensee's QA program and inspection of program implementation during the performance of construction-related work. For example, IMC-2501 requires reviews of the QA measures exercised in the development of the application for an early site permit. In accordance with IMC-2502, NRC staff will inspect the scope of the licensee's QA manual for construction and confirm that the procedures and instructions to assure quality are being implemented by appropriately trained and qualified staff. As set forth in both IMC-2503 and IMC-2504, each observation of construction activities will monitor the implementation of the QA program by the licensee and its contractors to ensure their ability to find and appropriately characterize and resolve any conditions adverse to quality that may occur. A licensee's ability to provide adequate levels of oversight is a key component in NRC's licensee assessment program. During the periodic assessment reviews by the NRC, the ability

of the licensee to find and successfully resolve problems will be considered when deciding if a SAYGO determination is warranted. The structure of the NRC's construction inspection process, including the rules for making and documenting SAYGO determinations, will be detailed in IMC-2505. (LL 4a, 4b, 4c) (IPI 12)

ITAAC Closeout

The process of closing out each individual ITAAC involves action by the licensee and NRC's construction inspection and new reactor licensing organizations. A proposed program for NRC verification and closeout of a licensee's completion of ITAAC was described in SECY-00-0092. Elements of this proposed program included certification by the licensee to the NRC that an ITAAC had been successfully performed and that the acceptance criteria had been met. The industry and NRC staff currently are discussing the specific form and content for such a letter. The staff will continue to engage the industry to reach a common understanding on what information is necessary to document the successful completion of a specific ITAAC. The staff plans on using an approach for engaging stakeholders similar to that used for operational programs. The results of those interactions and a full description of the ITAAC determination process will be presented in a future Commission paper. Successful resolution of all issues associated with NRC review of ITAAC documentation is critical because of the significant number of licensee ITAAC closeout letters the staff expects to receive during the later stages of construction. And because current projections indicate that construction will be occurring on multiple plants at the same time, the staff expects to have to verify a significant number of ITAAC closeouts simultaneously. In addition, the introduction of DOE standby support for certain nuclear plant delays emphasizes the importance of ensuring the timely completion of inspections and ITAAC closeout activities.

Upon receipt of an ITAAC letter, the staff will perform an acceptance review to ensure that the information submitted is appropriate and complete for each specific ITAAC. The licensing staff will then consult with the construction inspection staff to confirm that planned inspections have been completed for that ITAAC and that there are no open items or findings related to that ITAAC that would prevent it from being closed. NRC licensing staff will perform an independent ITAAC verification and closeout that will be informed by a review of the inspection history contained in CIPIMS and a review of the information submitted or referenced by the licensees in its ITAAC letter. In this way, every ITAAC will receive a final review by the staff.

In accordance with 10 CFR 52.99, the staff is required, at appropriate intervals during construction, to publish *Federal Register* notices of the successful completion of inspections, tests, and analyses. The periodic notices will not only inform the public that the licensee has completed the inspections, tests, and analyses in one or more ITAAC, but also that the staff has completed its review of the involved ITAAC and has found that the licensee successfully completed the ITAAC. The notices will list the licensee documents reviewed, identify the ITAAC inspections performed and their results, summarize the pertinent information from the licensees ITAAC determination bases documents relied on by the staff when reaching its conclusion related to each ITAAC, and notify the public of the staff's conclusions. The specific content and frequency of issuing the notices of successful ITAAC completion are still being considered but will be fully described in a future paper to the Commission. (IPI 5 and 10)